

REMARKS

The Examiner is thanked for the thorough review of the present application. Independent claim 17 has been amended, to rewrite claim 20 in independent form, and claim 20 has been cancelled, for consistency therewith. Indeed, no new issues are presented by this amendment. MPEP §706.07(a).

Claims 17-18 and 21-28 are pending in the present application. Claims 17-18, 21-26 and 28 have been rejected under 35 USC 103 as being unpatentable over Deckard in view of Sachs et al. and Lewis et al. Additionally, claim 27 has been rejected under 35 USC 103 as being unpatentable over Deckard in view of Sachs et al., Lewis et al., and Loschau.

Reconsideration of the amended application in light of the above Remarks and following arguments is respectfully requested.

Rejection of claims 17-18 and 21-28 under 35 USC 103

The Examiner rejected amended independent claim 17 (dependent claim 20) under 35 USC 103 as being unpatentable over Deckard in view of Sachs et al. and Lewis et al. Amended independent claim 17 recites the step of preparing a powder bed having a first powder mix in a first region and a second powder mix in a second region, where the first and second powder mixes differ from each other in the chemical composition and/or powder particle size distribution. Additionally, amended independent claim 17 recites the step of forming a first/second region of the shaped object by a first/second laser sintering of the first/second powder mix, and that the respective first/second laser sintering is controlled to provide different material properties in the first and second regions of the shaped object. Additionally, amended independent claim 17 recites controlling a laser beam generated during the respective first/second laser sintering processes, to produce a different sintering temperature over the first and second regions of the object, creating a different degree of densification in the first and second regions of the shaped object. None of the Deckard, Sachs et al., or Lewis et al. references, alone or in combination, discloses these recitations, and accordingly, amended claim 17 is patentable.

The Examiner contended that Deckard discloses a first powder mix in a first region, where the first powder mix is formed by a first laser sintering of the first powder mix, and cited

to FIGS. 1-2 and col. 5 line 64 – col. line 2, in support thereof. Deckard discloses a confinement structure 28, which receives a single type of powder from a powder dispenser 14 (see FIG. 1; col. 4, lines 40-45). Various optics are arranged, to align a laser 12 into the powder of the confinement structure 28, and undergo a scan pattern 66 (see FIG. 2), based on a driver 50 and galvanometer 48 (col. 5, lines 33-47). Various layers 54-57 of the powder 22 are formed within the dimensions of the confinement structure 28 (see FIG. 2; col. 5, line 45), and various scan modes of the laser 12 may be utilized, to adjust the patterns formed on each layer 54-57 (col. 6, lines 13-24).

The Examiner conceded that Deckard fails to disclose a second powder mix in a second region; that the first and second powder mixes differ from each other in chemical composition and/or powder particle size distribution; and the step of forming a second region of the shaped object integral with the first region by a second laser sintering of the second powder mix; looked to Sachs et al. to provide this noted deficiency, and cited to col. 11, lines 15-20 in support thereof. However, this portion of Sachs et al. merely teaches that two types of powder “can be applied via two or more separate powder dispersion heads so as to deposit the different powders at different regions of the part being formed” (col. 11, lines 16-20). Sachs et al. generally involves forming a component by depositing a layer of powder in a region, depositing a binder material to selected regions of the powder material, and then repeating these steps to achieve layers of bonded powder material, while removing unbonded powder (Abstract). Indeed, Sachs et al. fails to disclose the step of forming a second region of the shaped object integral with the first region by a second laser sintering of the second powder mix, as contended by the Examiner. Instead, Sachs et al. discloses that a second powder mix should be applied through a second dispersion head, onto the surface of a component. Accordingly, none of the cited prior art references, alone or in combination, disclose the step of forming a second region of the shaped object integral with the first region by a second laser sintering of the second powder mix, and accordingly, amended independent claim 17 is patentable.

The Examiner contended that it would have been obvious to modify Deckard, based on the cited teachings of Sachs et al., “for benefit of producing shaped objects with regions of different materials.” (Office Action, p.3). The Examiner’s suggested modification of Deckard would involve removing the powder 22 from the confinement structure 28 and inserting the powder 22 within a dispersion head, to be deposited onto the surface of a component, along with

a second powder being similarly deposited onto the surface of the component, from a second dispersion head. Indeed, the Examiner's suggested modification of Deckard would eliminate the laser 12, optics, and thus the sintering process disclosed in Deckard, thereby destroying the purpose of Deckard, as the cited teaching in Sachs et al. specifically teaches that the first and second powder are to be individually applied from separate dispersion heads. Thus, even if the Examiner's suggested modification of Deckard was obvious, it would fail to disclose the step of forming a first/second region of the shaped object by a first/second laser sintering of the first/second powder mix, as recited in amended independent claim 17. Accordingly, amended independent claim 17 is patentable.

The Examiner conceded that the Deckard/Sachs combination fails to disclose that the respective first/second laser sintering is controlled to provide different material properties in the first and second regions of the shaped object, as recited in amended independent claim 17, and cited to col. 4, lines 20-21 and col. 21 lines 14-22 of Lewis et al., to provide this noted deficiency. However, these cited portions of Lewis et al. merely disclose that one object of the invention is "to produce articles having variable density" (col. 4, lines 20-21) and that density of an article may vary with laser power and/or a feed rate of powder which is melted by the laser (col. 21, lines 14-22). As discussed in the previous Amendment filed on August 6, 2009, Lewis et al. does not describe a sintering process, but only a melting process. Sintering is a method for making objects from powder by heating the powder to below its melting point until its particles adhere to each other. In contrast, the unmelted powder of Lewis is collected and returned to the powder container for reuse (col. 7, lines 38-40). Powder particles which are not completely melted by the laser energy are melted by the heat of the molten pool of material (col. 5, lines 64-67). Even if a particle remains somewhat unmelted within the pool, there is no evidence in Lewis or basis for a conclusion that any sintering of powder occurs, since the molten pool is controlled to be small and the re-solidification of the pool occurs quickly as the laser moves along the tool path (Lewis col. 6, lines 8-28). Indeed, neither the cited portions of Lewis et al, nor any portion thereof, discloses that the respective first/second laser sintering is controlled to provide different material properties in the first and second regions of the shaped object, as recited in amended independent claim 17. Accordingly, amended independent claim 17 is patentable.

In rejecting amended independent claim 17 (dependent claim 20), the Examiner contended that Lewis et al. discloses the step of controlling a laser beam generated during the respective first/second laser sintering processes, to produce a different sintering temperature over the first and second regions of the object, creating a different degree of densification in the first and second regions of the shaped object, as recited in amended independent claim 17. As discussed above, Lewis et al. does not disclose a laser sintering process of the powder, and thus necessarily fails to disclose the step of controlling a laser beam generated during the respective first/second laser sintering processes, to produce a different sintering temperature over the first and second regions of the object, creating a different degree of densification in the first and second regions of the shaped object, as recited in amended independent claim 17.

Accordingly, amended independent claim 17 is patentable. Its dependent claims, which recite yet further distinguishing features, are also patentable, and require no further discussion herein.

Conclusion

Applicants respectfully request that the Examiner reconsider the rejections and timely pass the application to allowance. All correspondence should continue to be directed to our below-listed address. Please grant any extensions of time required to enter this paper. The commissioner is hereby authorized to charge any appropriate fees due in connection with this paper or credit any overpayments to Deposit Account No. 19-2179.

Respectfully submitted,

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